Specialization:	Telecom. Engineering		Palestinian National Authority Ministry Education & Higher Education Palestine Technical University College of Engineering & Technology
Course Name:	Fiber Optics		
Date:	12/8/2012		
Time:	08:30-9:30		
Instructor:	Dr. Mutamed Khatib		First Exam Summer semester 2011/2012
Name: [redacted] معن سلام قفدان		Section: 1	Mark: 23.5 /30

الهندسة كهربائية تقنية - اتصالات

Q1. *(5 marks)* Optical component are simpler than those used in wireless communications. Explain that.

In wireless communications ~~we~~ use antennas and modulators, demodulators, and this components is complex if we compare it with optical fiber components, we use in optical fiber LED or LD as carrier source, and ~~use~~ lenses as input and output couplers and use photodetector in the output side.

⊛ It simpler than wirless communication (EM waves is more complicated than light).

Q2. *(5 marks)* Light travelling in ~~air~~ air strikes a glass plate at an angle $\theta_1 = 33^o$ where θ_1 is measured between the incoming ray and the normal to glass surface. Upon striking the glass, part of the beam is reflected and part is refracted. If the refracted and reflected beams make an angle of 90^o with each other, what is the refracted index of the glass?

⊛ Snell's Law

$$\frac{\sin \theta_t}{\sin \theta_i} = \frac{n_1}{n_2}$$

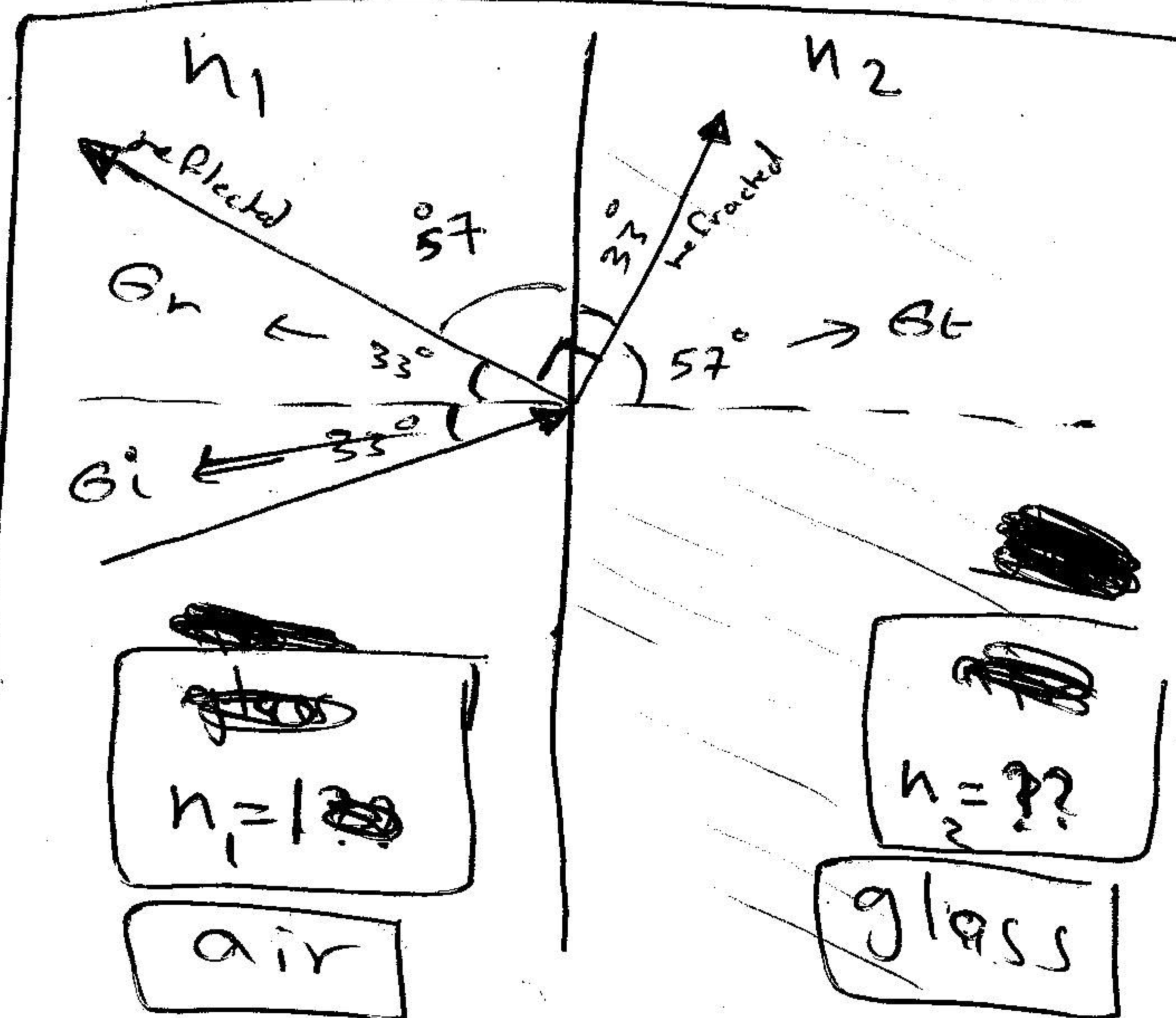
$n_1 \rightarrow$ glass, $n_2 \rightarrow$ air

$$\frac{\sin 57^\circ}{\sin 33^\circ} = \frac{1}{n_2}$$

$n_2 = 1.29$

$1 < n < \infty$

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خليت السؤال مثل ما هو

Q3. *(5 marks)* Fiber optics are considered as secured transmission systems, explain that.

because optical fiber are insulator, there is no current flow through it, and does not affect by an EM Waves, and there is no radiation going outside the fiber rod.

① no current flow through fiber.
② no radiation flow outside fiber
③ Cannot be affected by EM Waves.

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Q4. *(5 marks)* Find the number of photons incident on a detector in 1 second if the optic power is 1 μw and the wavelength is 0.8 μm.

① $\lambda = \frac{V}{F} \Rightarrow f = \frac{V}{\lambda} = \frac{2.99 \times 10^{8}}{0.8 \times 10^{-6}} = 373.75\ THZ$

② $W_p = hf = 6.626 \times 10^{-34} \times 373.75 \times 10^{12}$

$2476 \times 10^{-22} = 2.47 \times 10^{-19}\ J$

③ $W = Pt = 1 \times 10^{-6} \times 1s = 1 \times 10^{-6}\ J$

④ $\#\ of\ photons = \frac{W}{Wp} = \frac{1 \times 10^{-6}}{2.47 \times 10^{-19}}$

$= \frac{1 \times 10^{-6} \times 10^{19}}{2.47}$

0.404×10^{13}

$= 4.04 \times 10^{12}$ photons

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Q5. *(6 marks)* What is the region of light that is used in optical communication? Why other regions are not used?

the region ~~used~~ of light used in optical communication is the infrared ~~region~~ (IR).

① 469.11 THz ⟹ λ = 0.85 μm

② 230 THz ⟹ λ = 1.33 μm

③ 192.9 THz ⟹ λ = 1.5 μm

⊛ Other regions are not used (the visible region and the ultraviolet region) because of the high attenuation or the great losses happened in these regions.

Q6. *(4 marks)* Fill in the suitable devices in following table:

Object	Wireless communications	Optical Communications
Carrier source	Antenna	LED or LD
output coupler	EM wave demodulator	lenses
Input source	EM wave modulator	Rises
Detector	Antenna	photo detector

1.5

5 + 3 + 3 + 5 + 6 + 1.5 = 23.5 / 30